

A12 Circles Hard Answers

O Level P2

- 1 (a)(i) (EC =) 5 cm
- (ii) $\sin \hat{C} \hat{A} D = \frac{5 \text{ or their (a)(i)}}{13 \text{ or } [8 + \text{their (a)(i)}]} (= 0.3846\dots)$
- (C $\hat{A} D =$) 22.55($^{\circ}$) to 22.65($^{\circ}$)
- (b)(i) (Q $\hat{P} R =$) 70($^{\circ}$)
- (ii) (Q $\hat{Z} X =$) $\frac{1}{2}(180 - 52)$ **OR** Q $\hat{Z} X =$ Q $\hat{X} Z$ stated
- (Q $\hat{Z} X =$) 64($^{\circ}$)
- (iii) (Z $\hat{X} Y =$) 55 $^{\circ}$
- After B0, allow B1 for R $\hat{X} Y = 61^{\circ}$ or Z $\hat{O} Y = 110^{\circ}$

B1	1
M1	
A1	2
B1	1
M1	
A1	2
B2	
	2

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- (a) (i) (DCA =) 90 $^{\circ}$ (angle in semicircle)
- (ii) (DAC =) 34 $^{\circ}$ or 124 – their (i) (angle sum of triangle)
- (iii) (CBA =) 124 $^{\circ}$ (opposite angles of cyclic quad)
- (iv) (AEB [=ADB] =) 28 $^{\circ}$ (angles in same segment)

Lack of reason loses B1 on first occasion only

- (b) EBD = 28 $^{\circ}$ (alternate angles) Reason needed

Deduces BDX or BDA = EBD

And hence triangle BDX is isosceles

indep

- (c) (ABE =) 62 $^{\circ}$

- (d) Convincingly shows X is the centre of the circle

e.g. Deduces triangle ABX is isosceles, so AX = BX = DX

B1	
B1	
B1	
B1	4
B1	
B1	
B1	2
B1	
B1	1
B1	1

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(c) In this part give –1 **once** for omission of appropriate reason.

(i) ($\widehat{CEA}$) = 146° : Angle in the same segment.

(ii) ($\widehat{CBA}$) = 73° : Angle at the centre twice angle at circumf.

(iii) ($\widehat{CFA}$) = 34° : Angles in opposite segments supplementary

(iv) ($\widehat{DCF}$) = 73° or $180 - (\text{their(ii)} + \text{their(iii)})$ ✓
Opposite angles in a cyclic quad and/or angle sum of a triangle.

(*anw 3*)

B1

Or opposite angles of cyclic quads AOCF and AECF

B1

B1

May have been justified in (i)

B1 ✓

(4)

(12)

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(a)

(i) 38

(ii) 38

(iii) 74

(iv) 68

(b)

(y) = $\frac{1}{2}(90 - x)$ oe

1

1ft

Their (i) (must be $< 90^\circ$)

1

1ft

$180 - (\text{their (iii)} + \text{their (i) or (ii)})$
or $106 - \text{their (i)}$ dep on positive ans.

3

B2 for $y + y + 90 + x = 180$ or better

B1 for $ABO = y$ or $(OAC =) 90$

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(b) (i)

(a) $\widehat{QOS} = 90 - x$

and conclusion

(b) $\frac{1}{2}(90 + x)$ oe cao

(ii) (a)

 $3 \times \frac{1}{2}(90 - x)$
 $= 2 \times \frac{1}{2}(90 + x)$

leading to $180 + 2x$

 $= 270 - 3x$

(b)

18

1ft

1

2

M1 for $\frac{1}{2}(180 - (90 - x))$

2

M1 for $3 \times \frac{1}{2}(90 - x) = 2 \times \text{their } OQS$

1

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6	(a) (i)	23	1	
	(ii)	90 with reason	1	
	(iii)	Parallel lines established	1	
	(b)	Convincing argument	3	This must have e.g. $XQ = XY$ justified. If there is no justification, then MAX B2 from B1 for $XQ = XY$ oe And B1 for relating this to the perimeter of PXZ Or B1 for equal (alternate or bisected) angles

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7(b)(i)	$[P\hat{Q}T] = 58$	B1	
	$P\hat{T}Q = 32$ angles in same segment $T\hat{P}Q = 90$ angles in semi-circle $P\hat{Q}T = 58$ angles in triangle	B2	B1 for two reasons <i>Alternative:</i> $T\hat{S}Q = 90$ angles in a semi-circle $T\hat{S}P = 58$ $T\hat{Q}P = 58$ angles in same segment
7(b)(ii)	116	2	B1 for $S\hat{Q}R = 32$ or $Q\hat{S}R = 32$
7(b)(iii)	26	1	

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